THE DEVELOPMENT OF MULTIMEDIA LEARNING USING THE MOODLE PROGRAM ON INTEGRAL SUBJECT FOR SENIOR HIGH SCHOOL STUDENTS IN GRADE XII

Isnaepi[a], Suparman[b]
Program Studi Pendidikan Matematika Universitas Ahmad Dahlan
Jalan Ring Road Selatan, Tamanan, Banguntapan, Bantul, Yogyakarta
[a]iznaephy@gmail.com, [b]suparman@pmat.uad.ac.id

ABSTRACT

Multimedia learning on learning mathematics can help students visualize abstract materials to help students understand the material quickly. However, multimedia learning mathematics developed for the learning process of mathematics is only slightly. This research aims to develop multimedia learning using the MOODLE program on the integral subject for senior high school students in grade XII that feasible using on learning mathematics. This research is included in development research using the ADDIE development model. The research subjects are material experts, media experts, and State Senior High School 8 Yogyakarta (SMA Negeri 8 Yogyakarta) and State Senior High School 5 Yogyakarta (SMA Negeri 5 Yogyakarta). Data collection techniques used questionnaires, observations, and interviews conducted before developing the product. The research instruments used are observation guides, interview guides, and questionnaires to evaluate the learning multimedia that has been developed. The data analysis technique uses qualitative analysis that is converted into a Likert scale cumulative value. The result of the research showed that based on the analysis of multimedia learning needs, analysis of the characteristics of students, and analysis of problems encountered, obtained that methods of teaching teachers in monotonous, teachers who develop multimedia learning is only slightly, students often browsing related mathematics learning materials, students are difficult to understanding definite integral. Developed multimedia learning using the MOODLE program on the integral subject for senior high school students in grade XII that students quickly understood. The feasibility of developed products based on the calculation of average scores is an excellent category of material experts obtained for 4,37, excellent category of media experts obtained for 4,41, and decent category of students response obtained for 4,17. The student's response is decent, based on the result of the instrument of student response assessment.

Keywords: Multimedia Learning, MOODLE, ADDIE, Integral.

INTRODUCTION

Educators have a strategic function, role, and position in national development in the field of education. Educators, in this case, are teachers, are the main key in improving the quality of education. To improve the quality of education, a teacher must have abilities, academic qualifications, and competencies. As referred to in article 8 of the law, teacher competencies include pedagogical competencies, personal competencies, social competencies, and professional competencies obtained through professional education. One of the core competencies of pedagogical competence is to utilize information and communication technology to benefit learning.

From the competency standards above, teachers are required to develop innovative learning media (which can be in the form of visual media, audio media, audio-visual media, and multimedia) by the development of students and the development of information technology. Now many teachers use learning media to deliver material in the learning process. However, in the use of instructional media must also pay attention to the suitability of the media with teaching materials and characteristics of students so that the learning process reaches the learning objectives. Mathematics is a subject that is often considered difficult to learn for students. Therefore, the role of the media in learning mathematics is very important to help students in the thought process. The attractiveness of the media will provide real experiences for students in the process of learning mathematics. The media can also increase students to think concretely and can develop psychomotor skills in the learning process.

With the development of Science and Technology (IPTEK), especially information technology, the use of the internet in education continues to grow in Indonesia. This development was marked by the ease of accessing information from various internet-based sources and media. With advancements in

technology, the learning process does not have to bring students together with the teacher, but one can use learning media, such as the internet. This enables the development of mathematics learning media, namely web-based multimedia (e-learning). This learning multimedia becomes a tool or learning aid that is practical and time and energy-efficient. The advantage of using multimedia in learning through the use of computers as learning media in learning mathematics is increasingly relevant given the abstract object of mathematical studies. So that computer-assisted learning media can help students in visualizing abstract mathematical objects. Other benefits are obtained through the use of the internet as a learning medium, allowing learning interactions to occur wherever and whenever. Noting the benefits obtained above, it is necessary to try to develop multimedia web-based learning (e-learning).

The results of observations made at Yogyakarta State High School 8 and Yogyakarta State High School 5, namely, the school has adequate facilities. It also supports learning activities such as LCD projectors that are available in each class, and an internet connection that can be accessed by all school residents at any time. There are several reasons for researchers to develop e-learning. One of them is SMA Negeri 8 Yogyakarta and SMA Negeri 5 Yogyakarta. There is already computer-based learning, and it is easy to access the internet. Another reason is that when observing learning in class, in the learning process, most teachers still use the lecture and question and answer method without any variation of other learning methods. However, some teachers still use computers, such as the use of GeoGebra, to visualize graphs and geometry. Learning resources used by students are only in the form of books or handouts given by the teacher. It is still sporadic to find teachers developing web-based multimedia (e-learning) as teaching materials and learning media.

The results of interviews with mathematics teachers at SMA Negeri 8 Yogyakarta related to the mathematics learning process of integral material that students understand integral material, especially in the indeterminate integral. However, in an integral part of the course, students find it challenging to visualize graphic images in determining the extent of the area bounded by function. While the results of interviews with students of SMA Negeri 8 Yogyakarta, namely, students still lack understanding of integral material, of course, because the learning method used by mathematics teachers is the method of giving assignments and is too fast teaching. So that students still find it challenging to solve fundamental problems naturally.

The results of an interview with a mathematics teacher at SMA Negeri 5 Yogyakarta that in the mathematics learning process the integral material used by the teacher in the teaching method is the assignment method because for class XII students are focused on facing the UN. Also, students still have difficulty integrating trigonometric integrals and are related to integration techniques. While the results of interviews conducted with students conducted, namely, students feel that integral material is material that is difficult to understand. Constraints encountered are related to trigonometric integrals and integrations techniques. So students still lack understanding of integral material.

The primary material developed in e-learning is integral. The reason for choosing integral material is that integral material is one of the abstract material, and most students find it challenging to understand integral material, especially integral, of course. In the making e-learning, much software that can be used to make it, one of which is MOODLE (Modular Object-Oriented Dynamic Learning Environment). According to Suartama and Tastra (2014: 43), MOODLE stands for Modular Object-Oriented Dynamic Learning Environment, which is essentially the instructors and students doing teaching activities in online training. MOODLE can be easily used to develop e-learning systems and can be modified as needed. Also in creating e-learning can be modified with the help of GeoGebra 5.0 software in depicting a graph of a function or even in determining the area of an integral area. Therefore, the authors are interested in developing learning media assisted by e-learning models that utilize MOODLE and conduct research with the title Development of MOODLE-Based Learning Multimedia in Integral Subjects for High School Students in Class XII.

Based on the background above, it can be formulated the problem to be investigated, namely, how to develop MOODLE-based learning multimedia on integral subjects for SMA Negeri 8 Yogyakarta and SMA Negeri 5 Yogyakarta class XII that are easily understood by students? How do

you know the feasibility of multimedia learning based on MOODLE on integral subjects for SMA Negeri 8 Yogyakarta and SMA Negeri 5 Yogyakarta class XII that students easily understand? Moreover, how do students respond to multimedia learning that is developed?

This research aims to develop MOODLE-based learning multimedia on integral subjects for SMA Negeri 8 Yogyakarta and SMA Negeri 5 Yogyakarta class XII that are easily understood by students, knowing the feasibility of MOODLE-based learning multimedia on integral subjects for SMA Negeri 8 Yogyakarta and Yogyakarta State High School 5th grade XII that are easily understood by students and know the responses of students regarding multimedia learning that is developed.

METHODS

This research belongs to research and development. According to Sugiyono (2016: 407), Research development (research and development / R & D) is a research method to produce certain products, and test the effectiveness of these products. At the same time, the development model used in this study is the ADDIE model. According to Dick & Carrey (Tegeh, Jampel, and Pudjawan, 2014: 41), one of the development models that can be used in development research is the ADDIE model (Analyze, Design, Development, Implementation, Implementation, Evaluation).

There are five stages of the research procedure, namely: (1) Analysis (analysis), this stage is carried out to see the conditions associated with the mathematics learning process related to multimedia learning needs, curriculum analysis, student characteristics analysis, problem analysis. (2) Design (design): The design phase aims to design multimedia learning based on MOODLE in storyboards and flowcharts. (3) Development (development), in this development stage, is carried out by making a product that is e-learning by combining content that has been designed in the design stage. Material experts and media experts then validate the product. According to Sugiyono (2016: 414), Product validation can be done by presenting several experts or experienced experts to assess the newly designed product. Each expert is asked to assess the design so that further known weaknesses and strengths. At this stage, at the same time, followed by an evaluation to obtain input in terms of e-learning improvement. Furthermore, a product trial was conducted with ten students at each school. (4) Implementation (application), after the product is validated and tested, testing is carried out on two schools with 30 subjects in each school. Then a revision of the final product is conducted. (5) Evaluation This evaluation is carried out during the implementation phase with the help of media experts, material experts, and students based on the results of the questionnaire. It aims to find out how the feasibility of multimedia in the learning process.

Product trial designs developed in this study include, (1) initial product development, carried out with the guidance of media experts and material experts. (2) Product validation, carried out after the product development has been completed. Product validation is carried out by material experts and media experts to assess the feasibility of instructional multimedia and obtain input used as a basis for product revision. (3) At this stage, product revision I is carried out by input provided by media experts and material experts before product testing. (4) After the product is declared valid by media experts and material experts, the next step is product testing for ten students of SMA Negeri 8 Yogyakarta and ten students of SMA Negeri 5 Yogyakarta. (5) Product revision II, at this stage, a second product revision is carried out to improve the product to obtain appropriate multimedia used in the learning process. (6) Testing of use, after product testing and product revision II, use of testing is carried out to determine the feasibility of advanced multimedia. (7) The final product is obtained in the form of learning multimedia, which has been declared to be used in the mathematics learning process.

Data collection techniques using observations and interviews conducted before developing products and questionnaires. According to Sugiyono (2016: 199) stated that the questionnaire (questionnaire) is a data collection technique that is done by giving a set of questions or written statements to respondents to be answered. Data collection instruments in the form of (1) Observation guidelines, to find out the facilities available in schools and the learning process, researchers need observation guidelines as a reference in making observations at SMA Negeri 8 Yogyakarta and SMA

Negeri 5 Yogyakarta. (2) Interview guidelines, interviews are conducted with mathematics teachers and one of the XII grade students of SMA Negeri 8 Yogyakarta and SMA Negeri 5 Yogyakarta to find out the problems encountered in the mathematics learning process and ask for opinions related to multimedia learning based on MOODLE. (3) Validation sheet, validation sheet is used to determine whether the research instrument that has been designed is valid or not. (4) In this study, the questionnaire, a questionnaire containing research instruments, aims to assess the feasibility and quality of learning that has been developed. The data analysis technique used is to analyze each item questionnaire, both material expert questionnaire, media expert and questionnaire for students who have been quantified through stages, (1) Quantitative data, data that has been obtained through a questionnaire by material experts, media experts and participants students in the form of quantitative values will be changed to the cumulative value of the Likert scale. The provisions can be seen in the following Table 1.

Table 1. Rules for Scaling Using a Likert Scale

Information	Score
Strongly Agree (SS)	5
Agree (S)	4
Neutral (N)	3
Disagree (TS)	2
Strongly Disagree (STS)	1

Source: Riduwan dan Sunarto (2013:21)

(2) Determine the average, the data obtained is then calculated the average value. (3) Guidelines for assessment criteria, after knowing the ideal average of data obtained from material experts, the media, and students, the data is then converted into quantitative values based on ideal assessment criteria. The results of data analysis obtained are used as a basis for knowing the quality of the product being developed. The product developed is said to be feasible as a source of learning if the overall quality of e-learning is in the minimal category either. The provisions of these criteria are shown in Table 2 below.

Table 2. Criteria for Scale Category 5 Ideal Assessments

No	Score	Criteria
1.	$X > \bar{X}_i + 1{,}80SB_i$	Very good
2.	$\bar{X}_i + 0{,}60SB_i < X \leq \bar{X}_i + 1{,}80SB_i$	Well
3.	$\bar{X}_i - 0{,}60SB_i < X \leq \bar{X}_i + 0{,}60SB_i$	Enough
4.	$\bar{X}_i - 1{,}80SB_i < X \leq \bar{X}_i - 0{,}60SB_i$	Less
5.	$X \leq \bar{X}_i - 1{,}80SB_i$	Very less

Source: Widoyoko (2017:238)

RESULTS AND DISCUSSION

Table 2 shows the obtained multimedia eligibility criteria for material experts, media experts, and students' responses are shown in Table 3 below.

Table 3. Eligibility Criteria for Learning Multimedia

No	Average Quantitative Score	Qualitative Category
1.	$X > 4{,}20$	Very good
2.	$3{,}40 < X \leq 4{,}20$	Well
3.	$2{,}60 < X \leq 3{,}40$	Enough
4.	$1{,}80 < X \leq 2{,}60$	Less
5.	$X \leq 1{,}80$	Very less

Three material experts, namely, assessed the feasibility of the learning material. Sumargiyani, M.Pd. As a Lecturer in Mathematics Education Ahmad Dahlan University, Joko Tri Prihono, S.Pd. As a Mathematics Teacher at SMA Negeri 8 Yogyakarta, and Sapto Nugroho, M.Pd. As a Mathematics

Teacher at SMA Negeri 5 Yogyakarta. The calculation of the feasibility of a multimedia learning questionnaire by material experts is shown in Table 4, which is as follows.

Table 4. Results of the Calculation Questionnaire for Material Feasibility

No	Material Expert	Average Score	Criteria
1.	Dra. Sumargiyani, M.Pd.	4,57	Very good
2.	Joko Tri Prihono, S.Pd.	4,50	Very good
3.	Sapto Nugroho, M.Pd.	4,00	Good
	Amount	13,07	
	Average	4,37	Very good

Based on Table 4, it can be seen that the average score obtained from the expert material assessment was 4.37. Then these results indicate that the developed learning multimedia in terms of material included in the excellent category.The feasibility of learning multimedia was assessed by three media experts, namely Syariful Fahmi, M.Pd. As a Lecturer in Mathematics Education Ahmad Dahlan University, Heri Susanta, S.Pd.T. as a teacher of Information and Communication Technology (ICT) SMA 8 Yogyakarta, and Diah Muslihah, S.T. as an ICT teacher at SMA Negeri 5 Yogyakarta. The results of the calculation of the feasibility of a multimedia learning questionnaire by media experts are shown in Table 5, which is as follows.

Table 5. Results of the Media Feasibility Questionnaire Calculation

No	Material Expert	Average Score	Criteria
1.	Syariful Fahmi, M.Pd.	4,63	Very good
2.	Heri Susanta, S.Pd.T.	3,73	Good
3.	Diah Muslihah, S.T.	4,87	Very good
	Amount	13,23	
	Average	4,41	Very good

Based on Table 5, it can be seen that the average score of the results of the assessment of media experts is 4.41. It can be concluded that the developed learning multimedia in terms of media is included in the excellent category.

The response of students to learning multimedia that is developed is known from the results of the assessment of students through questionnaires that are distributed and filled out during product trials and usage trials. The results of the questionnaire assessment in product trials are as follows.

Table 6. Results of Calculation of Questionnaire Responses of Students in Product Trials

No	Material Expert	Average Score	Criteria
1.	SMA Negeri 8 Yogyakarta	4,05	Good
2.	SMA Negeri 5 Yogyakarta	4,27	Very good
	Amount	8,32	
	Average	4,16	Good

Based on Table 6, it can be seen that the average score of the students' response assessment results in the product trial is 4.16. It can be concluded that the results show the responses of students in both categories.

The following results of the calculation of the questionnaire responses of students in the trial use are shown in Table 7.

Table 7. Results of Calculation of Student Questionnaire Responses in Usage Trials

No	Material Expert	Average Score	Criteria
1.	SMA Negeri 8 Yogyakarta	4,08	Good
2.	SMA Negeri 5 Yogyakarta	4,26	Very good
	Amount	8,34	
	Average	4,17	Good

Based on Table 7, it was found that the average score of the students' response assessment results in the use of the trial was 4.17. So it belongs to the good category.

CONCLUSION

The results showed that based on the analysis of multimedia learning needs, analysis of student characteristics, and analysis of the problems encountered, obtained by the method of teaching monotonous teachers, teachers who develop multimedia themselves learning a little, students often browse related mathematics learning material, students are difficult in understanding integral material certainly. So the MOODLE-based mathematics learning multimedia was developed on an integral subject for high school students in class XII that is easily understood by students. The feasibility of the developed products is feasible based on the calculation of the average score included in the excellent category of material experts obtained by 4.37 and media experts by 4.41 and included in both categories of student responses of 4.17. Students 'responses regarding multimedia learning are well based on responses given through the students' response assessment instruments.

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